Statement of Research Interest of Simona Rolli

Past Achievements

I started working in High Energy Physics in 1991, as a Laurea and later Ph.D. student at the University of Pavia, Italy. My work at that time was of phenomenological interest, and under the guidance of prof Mario Greco I worked on aspects of fragmentation phenomena in the framework of perturbative QCD. We derived phenomenological fragmentation functions for light mesons from fits to collider data and subsequently used them to predict Next To Leading Order cross section rates for single particle inclusive production at different energies and machines. I wrote 5 papers in collaboration with Mario Greco's group and they constitute the main part of my Laurea and Ph.D. theses.

In 1994 I was visitor scholar at the NASA/Fermilab center for Astrophysics for 8 months. I was still a graduate student and while keeping working on QCD, I intended to get more familiar with aspects related to cosmology and in particular phase transitions in the early universe. The result of my residency at Fermilab was a series of general review seminars I gave at University of Pavia upon my return, summarized in "Scientifica Acta" Journal of the Graduate School in Physics of University of Pavia (Scientifica Acta, I quaderni del Dottorato, ***Volume IX N. 2***)

At the end of 1994 I joined the CDF experiment. Since then I participated in various CDF physics related activities and software development for the TeVatron Run II upgrade of the detector.

In the framework of the top analysis I was working on aspects of the systematic uncertainty related to gluon radiation in the top production and jet energy corrections.
In 1996 I started getting involved in analysis concerning searches for physics beyond the Standard Model. I worked on the analysis aimed at searching for the supersymmetric partner of the bottom quark using Run I data.
In 1998 I was appointed co-leader of the Exotic Triggers & Datasets working group, a subgroup of the Exotic physics group. At this time Run I had ended and CDF was in a full detector upgrade phase. The work of this group was essential to design and implement the triggers aimed at searches of new physics. At the same time I was appointed leader of the trigger simulation project and the two roles did interplay nicely. I was supervising a Ph.D. Italian student working on triggers for Higgs searches and I summarized our work at the Snowmass meeting in 2001.

In January 2001 I was appointed leader of the Exotic physics group. CDF just ended the commissioning run of the CDFII detector and the focus was shifting on getting ready to produce physics results. In 2001 most of the work was still focused on defining datasets, test triggers and develop common sets of ID cuts. In 2002 CDF started producing its first Run II physics results. As the delivered luminosity was still low in respect to Run I, most the analyses were really test grounds for methods and tools. I became involved in the searches for Leptoquarks of 1^{st} and 2^{nd} generation, and preliminary results were shown at

Moriond 2003, EPS 2003 the the LeptonPhoton Symposium at Fermilab. I'm currently tutoring two graduate students from Tufts University on their thesis project.

I have been a member of the ATLAS collaboration since 1997. I worked on data handling issues and was a member of the RD44 and RD45 collaborations. These collaborations were set up to investigate and produce recommendations regarding the persistency mechanism to be used to store data at the LHC experiments as well as to assess the needs and solutions needed in the framework of a distributed networked analysis system envisioned for the LHC era. The experience gained working in RD44 and RD45 was put to work at CDF as well.
I worked on the proposal for a data handling system based on the use of a OO database (Objectivity/DB) for CDF. A prototype database system was built to transfer Run I CDF data and to make them accessible via OO visualization/analysis tools.
In 2001 I started working on a simple ntuple representation of the CDF event.
CDF has indeed adopted ROOT as its data underlying persistency mechanism, but it has hidden the details of it under and intermediate layer (EDM or Event Data Model) accessible via Application Modules of AC++, the OO version of Analysis Control, developed jointly by CDF and BaBar.
The idea was to allow for a quick translation of the data into a flat ROOT Tree, via a standard set of "ntuplizers" for the various objects contained in the CDF event. This would have allowed us to be de-coupled from the framework for all the type of analysis not requiring the use of reconstruction modules, while at the same time maintaining a one-to-one correspondence with the event content.

Future Plans

My current research interest is focused on CDF and on a longer term on the LHC experiments. I consider these experiments to be the best in the next decade in hadron collider physics and I believe they offer a wide potential for physics discovery.

Although the current luminosity reach of Run II has been sizably reduced (with negative consequences in respect to, for examples, Higgs searches) the new features of the detector are still very useful for other analysis aimed at searches for new phenomena. In particular I'm interested in exploiting the capability of tagging events enriched in heavy flavors at the trigger level (Silicon Vertex Trigger) for searches for third generation squarks. Also, given the experience I have now gained in the leptoquark analysis in signatures involving leptons, I'm interested now to move on to searches for Supersymmetry in channels involving leptons, jets and missing energy.

In the longer term I am very interested in working for the LHC. My main interest is in looking for the Higgs boson and searches for new phenomena. The exact scope of my physics interest will be of course shaped in the course of Run II, as most of the results

obtained at the TeVatron will be the starting point for LHC analysis strategies. The experience I have accumulated in CDF will be of course very useful at LHC.
I would like to keep being involved in aspects of data handling and storage, and software development in general. As Fermilab will be one of the leading institutions in US CMS, I would like to be involved in the activities related to the management of the regional computing facilities for CMS and physics analysis at Fermilab and at Universities in the United States. I would like to participate in the development of the U.S. CMS physics Facility at Fermilab.